Environmental Statement Public Inquiry

Direction Order Public Inquiry

Vesting Order Public Inquiry

Stopping Up of Private Accesses Public Inquiry

Submission on

Surface Water Quality

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Contents

Glossary & Abbreviations

Glossary

Abstraction	Removal of water from a watercourse or groundwater, usually by pumping
Abutment	Part of a bridge that is adjacent to the river
Accidental Spillage	Any spillages or major leaks of potentially polluting substances on the operational road as a result of road traffic accidents or vehicle fires, which may result in acute pollution
Acute Pollution	A severe, usually short term pollution impact. Usually results from accidental spillage of pollutants, but can result from routine runoff. Acute pollution is generally associated with soluble pollutants which are sufficiently toxic above certain concentrations to result in the death of organisms over a relatively short period of time (usually hours/days).
Attenuation Pond	Pond or lagoon where the inflow varies and the outflow is restricted to a maximum rate. Used to control runoff and prevent flooding by slowing or 'attenuating' the flow.
Chainage	Distance along the road measured in metres.
Cofferdam	A temporary dam, usually of sheet piling driven into the ground to exclude water and provide access to an area that is otherwise submerged or waterlogged
Culvert	Covered channel or pipe which is used to continue a watercourse or drainage path under an artificial obstruction e.g. road embankment.
Cyprinid Waters	Fresh waters capable of supporting, or would be capable of supporting if pollution was reduced or eliminated, cyprinid fish species such as carp, roach, tench and minnow.
Chronic Pollution	A low level, long term pollution impact. Usually results from routine runoff. Chronic pollution is generally associated with the accumulation of sediment bound pollutants over a long period of time (months/years). These low levels of pollutants can result in non-lethal effects such as reduced feeding, growth rates and reproduction of organisms.
Design Manual for Roads and Bridges	The main reference document for the road designer containing all the technical papers required to develop a new road from feasibility through to construction.
Discharge	Disposal of water or effluent into a watercourse or groundwater
Environmental Quality Standards	The maximum permissible annual average concentrations of potentially hazardous chemicals, as defined under the WFD.

Filter Bund	A barrier, dam or mound made of slowly permeable material e.g. gravel or straw bales, used to contain and treat sediment laden surface runoff. The runoff filters slowly through the bund trapping the sediment behind the bund material
Fluvial Geomorphology	The study of rivers and streams, and the processes that form them
Geotextile	Permeable fabrics used to reinforce and protect soils or to filter sediment laden surface water runoff
HAWRAT	Highways Agency Water Risk Assessment Tool, a Microsoft Excel application designed to assess the short-term risks related to the intermittent nature of road runoff. It assesses the acute and chronic pollution impacts on aquatic ecology associated with soluble and sediment bound pollutants respectively
Mainstem	The main channel of a river, excluding the smaller tributary streams that feed into it.
Manhole Silt Trap	A small chamber with a sediment collection sump, designed to trap sediments and other debris, and settle out a proportion of suspended solids and metals
Oil Bypass Separator	A chamber designed to contain oil and other hydrocarbons that have entered a drainage system. Oil is removed from the water and retained within the separator.
Outfall	End of a temporary or permanent pipeline from which water or other effluent is discharged. This can refer to either the end of a length of pipe or to a dedicated structure.
Plan-form	The outline shape or morphology of a body of water (such as a lake or river), as defined by the still water line.
Routine Runoff	The normal runoff from roads that may include the contaminants washed off the surface in a rainfall event.
Salmonid Waters	Fresh waters capable of supporting, or would be capable of supporting if pollution was reduced or eliminated, salmonid fish species such as salmon, trout and char.
Sediment	Particles such as soil, sand, clay, silt and mud which comprise the main water pollutant from construction sites. See also Suspended Solids.
Sediment Bound Pollutants	Pollutants including some metals and hydrocarbons that become chemically or physically attached to sediment particles and that travel with the sediment.
Settlement Pond	Pond, tank or lagoon used to hold water in order to reduce turbulence, thus allowing solid particles to settle out.

Siltbuster	Mobile silt trap designed to remove suspended sediment particles from water discharge. Generally more effective and more space-efficient than settlement ponds.
Silt Fence	Temporary sediment control device usually consisting of a synthetic filter fabric or geotextile stretched between a series of wooden or metal fence posts along a horizontal contour level. Sediment is trapped against the fabric and retained whilst the water drains through.
Silt Trap	A settling chamber or basin that prevents waterborne sediment from entering a pond or drainage system.
Soluble pollutants	Pollutants including some metals and hydrocarbons that dissolve readily in water and are transported within the water.
Special Area of Conservation	Established under the EC Habitats Directive (92/43/EEC), implemented in Northern Ireland by the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995. Special Areas of Conservation are sites identified as being significant in habitat type and species and are considered to be in greatest need of conservation at a European level.
Surface Flow Wetland	A shallow basin which is kept permanently wet with surface water flow and is planted with common reed swamp vegetation. The vegetation within the wetland provides significant treatment of both soluble and sediment bound pollutants through filtration, adsorption and plant uptake
Suspended Solids	General term describing particles such as sand, clay, silt and mud in suspension in water. Used as a water quality indicator.
Sustainable Urban Drainage Systems	A sequence of management practices and control structures designed to drain surface water in a more sustainable manner than some conventional techniques. Typically, SUDS are used to attenuate rates of runoff from development sites and can also have water purification benefits.
Watercourse	Any river, stream, inland water (whether natural or artificial) or tidal waters and any channel or passage of whatever kind (whether natural or artificial) through which water flows, but does not include water supply mains, sewers or any drain or pipework constructed, laid or acquired as part of a road drainage network.

Abbreviations

A5 WTC	A5 Western Transport Corridor
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
CMS	Construction Method Statement
DEFRA	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency of England and Wales
EQS	Environmental Quality Standard
ES	Environmental Statement
FD	Fish Directive
HAWRAT	Highways Agency Water Risk Assessment Tool
NIEA	Northern Ireland Environment Agency
PPG	Pollution Prevention Guideline
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SUDS	Sustainable Urban Drainage System
WFD	Water Framework Directive

1 Introduction

Personal Details

1.1 My name is Sarah Sutherland. I am employed as a Senior Environmental Consultant by Mouchel Group plc (Mouchel) based in Stirling, Scotland and have over 12 years post graduate experience in surface water quality, hydrology, and associated environmental impact assessment.

1.2 I graduated from the University of Leicester in 1997 with a Bachelor of Science honours degree in Physics with Space Science and Technology, and from the University of Birmingham in 1998 with a Master of Science degree in Applied Geophysics.

1.3 Since 2001 I have worked for Mouchel undertaking water related environmental impact assessment for a variety of developments, including windfarms, road schemes, quarrying and open cast coal extraction. I have also carried out hydrological assessments for a number of protected peatland sites.

Role and Responsibilities on the A5 WTC Project

1.4 I have been involved in the A5 Western Transport Corridor (A5 WTC) project since 2008 as the technical lead for the surface water quality discipline of the Environmental Impact Assessment.

1.5 I have been responsible for the assessment of impacts on surface water quality throughout the scheme design, providing advice to the project design teams on surface water quality issues. I have worked closely with the Drainage Design and Ecology teams to ensure that the surface water quality issues are integrated into the planning and design process.

1.6 I have also been responsible for the co-ordination and preparation of Chapter 16 and associated appendices of the A5 WTC Environmental Statement.

2 Scope of Evidence

2.1 In this evidence I provide:

- a summary of key policies, legislation and guidance relevant to water quality;
- an overview of the extent and status of surface waters in the vicinity of the proposed A5WTC scheme and of the aspects of the scheme proposals that would potentially interact with surface waters;
- an explanation of the assessment of likely impacts during construction activities on the water quality of the watercourses in the vicinity of the proposed scheme;
- an explanation of the assessment of likely impacts on surface water quality potentially associated with routine runoff and accidental spillage following the opening of the road to use;
- an explanation of the assessment of potential impact of the proposed watercourse crossings and diversions on fluvial geomorphology in as much as this can affect watercourse quality;
- an outline of proposed mitigation measures; and
- a description of location-specific impacts and mitigation in key areas.

3 Relevant Legislation and Guidance

Legislation

3.1 The following legislation has been taken into account during the assessment:

The Water Framework Directive (WFD) – Directive 2000/60/EC

3.2 The requirements of the Directive are implemented through the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003. Both make provision for the maintenance and improvement of the 'ecological status' of inland surface waters. The ecological status of a waterbody is measured through a range of biological quality elements, supported by measurements of physico-chemistry, hydrology and geomorphology. The aim is for designated waterbodies to achieve 'good ecological status' by 2015. Certain waterbodies may be designated as artificial/heavily modified and will have less stringent targets to meet, however these will still need to demonstrate 'good ecological potential' by 2015. There are provisions in the Directive to allow deterioration in waterbody status where there is an overriding public interest and benefit from doing so.

3.3 The Directive does not place specific requirements upon developers. The Northern Ireland Environment Agency (NIEA) does, however, have powers to object to proposals or insist on the implementation of mitigation measures where schemes are likely to adversely impact the ecological quality of inland waters designated under the Directive.

The Fish Directive (codified version) (FD) – Directive 2006/44/EC

3.4 The Directive makes provision for the protection and improvement of the quality of fresh waters capable of supporting, or potentially capable of supporting certain fish species, should pollution be reduced or eliminated. The Directive requires that relevant waterbodies are classified as either Salmonid or Cyprinid waters. It also sets down minimum water quality criteria that must be met by such waters.

3.5 The Directive does not place specific requirements upon developers. The NIEA does, however, have powers to object to proposals or insist on the implementation of mitigation measures where schemes are likely to adversely impact the quality of waters designated under the Directive.

The Water (Northern Ireland) Order 1999 (as amended)

3.6 The Order makes provision for combating and preventing pollution of waterways and groundwater. Under the Order 'waterways' are defined as any river, stream, watercourse, inland water (whether natural or artificial) or tidal waters and any channel or passage of whatever kind (whether natural or artificial) through which water flows, but does not include water supply mains, sewers or any drain or pipework constructed, laid or acquired as part of a road drainage network. Under the Order discharges to a waterway must be authorised by the NIEA as the competent authority. NIEA also have a duty to find and stop sources of pollution;and have powers of enforcement and prosecution. The Order, in conjunction with the Water Abstraction & Impoundment (Licensing) Regulations (NI) 2006, also controls abstraction and impoundment from waterways, for which authorisation from NIEA is required.

The Fisheries Act (Northern Ireland) 1966 (as amended) and the Foyle Fisheries Act (Northern Ireland) 1952 (as amended)

3.7 Under these Acts it is an offence to pollute a watercourse, obstruct the passage of fish or disturb the spawning beds of salmon, trout and eels. It is also an offence to remove material from the bed of a river without consent. Enforcement is carried out by the Department of Culture, Arts and Leisure (DCAL) Inland Waterways & Fisheries Division, except in the Foyle and Carlingford Catchments where responsibility lies with the Loughs Agency.

Part II of the Food and Environmental Protection Act 1985 (FEPA)

3.8 The aims of the Act are the protection of the marine environment and human health, and the minimisation of nuisance or interference to other legitimate users of the sea. Under the Act the NIEA has responsibility, as the competent authority, for controlling construction work which involves placing material below the Mean High Water Spring (MHWS) tidemark.

Legislative Compliance

3.9 In light of the requirements of the above listed legislation the likely impacts, including potential pollution risk, from the A5WTC on water quality, hydrology and geomorphology for all potentially impacted waterbodies, waterways and fisheries, as designated under the various legislation, has been assessed. I am confident that this assessment has been carried out to an appropriate level for the current stage of development of the A5 WTC in the A5 WTC ES.

3.10 In addition authorisation would be sought from the NIEA for all construction and operational drainage discharges, subject to the outcome of the Public Inquiry and any subsequent approval. This would include FEPA licences for those outfalls constructed in the vicinity of the MHWS within the tidal reach of the River Foyle and River Finn. Authorisation would also be sought from NIEA for temporary abstractions and impoundments which would be required during construction e.g. during construction of the proposed culverts and watercourse diversions.

3.11 Proposed bridges, culverts, diversions and outfalls have been designed and would be constructed such that they do not obstruct fish passage, in line with the requirements of the fisheries acts. In addition consents would be sought from DCAL and Loughs Agency for any in-stream construction.

Guidance

3.12 The guidance provided in the following documents has also been taken into account:

- CIRIA Report C697 The SUDS Manual;
- CIRIA Report C609 Sustainable Drainage Systems: Hydraulic, Structural and Water Quality Advice;
- CIRIA Report C521 Sustainable Urban Drainage Systems: Design Manual for Scotland and Northern Ireland;
- DMRB Volume 4, Section 2, Part 1, HA 103/06 Vegetated Drainage Systems for Highway Runoff;
- DMRB Volume 4, Section 2, Part 3, HD 33/06 Surface and Sub-Surface Drainage Systems for Highways;
- CIRIA Report C648 Control of Water Pollution from Linear Construction Projects: Technical Guidance;
- Relevant NIEA Pollution Prevention Guidelines (PPGs);

- SEPA Engineering in the Water Environment Good Practice Guide: Construction of River Crossings (WAT-SG-25);
- SEPA Engineering in the Water Environment Good Practice Guide: Temporary Construction Methods (WAT-SG-29);
- SEPA Engineering in the Water Environment Good Practice Guide: Intakes and Outfalls (WAT-SG-28);
- Scottish Executive Guidelines on River Crossings & Migratory Fish: Design Guidance;
- River Diversions: A Design Guide (Fisher and Ramsbottom, 2001);
- DEFRA/EA R&D Technical Report FD1914 – Guidebook of Applied Fluvial Geomorphology.

4 Baseline Environment, Proposed Scheme and Potentially Significant Impacts

Surface Water Environment

4.1 The study area for the surface water assessments lies entirely within the catchments of the River Foyle and River Blackwater, and includes a number of their major tributaries, namely the Burn Dennet, Glenmornan, Finn, Mourne, Derg, Strule, Fairy Water, Drumragh, Camowen, Roughan and Ballygawley rivers. The proposed scheme would cross numerous small tributary streams and field ditches within these catchments. There are also several small ponds, an abandoned reservoir, a flooded quarry and a number of small surface water abstractions within the study area.

4.2 The study area includes the River Foyle and Tributaries SAC which has three qualifying interests: plain to montane level habitat with *Ranunculion fluitantis* (Water Crowfoot) and *Callitricho-Batrachion* vegetation, Atlantic Salmon and Otter. In addition to the River Foyle the SAC boundary includes the mainstem of the Finn (as far upstream as Clady), Mourne, Derg and Lower Strule rivers. The route alignment of the proposed road requires bridge crossings over the Mourne and Derg within the SAC boundary. In addition works would be required on watercourses outwith the SAC but within the River Foyle catchment. The construction and engineering activities proposed in the vicinity of each of these watercourses are outlined in the evidence of William Diver, Morgan Sheehy and Stephen McCaffrey, and in Volume 1, Chapter 16 and Volume 3, Appendix D of the ES.

Drainage Proposals

4.3 The drainage strategy and specific proposals for the proposed scheme are described in the evidence of Paul Carey, Kevin Chesworth and Declan Maguire.

4.4 There would be a total of 139 watercourse crossings, nine bridged river crossings and 130 culvert crossings of streams and field drains.

4.5 There would be 103 permanent watercourse diversions associated with streams and field drains. The majority of these are realignments and would be associated with the construction of culverts. The remaining diversions are proposed where the road alignment runs along the existing watercourse alignment or the watercourse weaves across the route alignment and would otherwise require multiple crossings over a short distance.

4.6 There would be 87 permanent outfalls, including seven outfalls which discharge to tidal reaches of the River Foyle and River Finn.

Potentially Significant Impacts

4.7 Potentially significant impacts on surface water quality and fluvial geomorphology may result from:

- ***Construction***: may lead to increased generation and release of sediments and suspended solids and increased risk of accidental spillage of pollutants such as oil, fuel and concrete during construction activities;
- ***Routine Road Runoff***: a broad range of potential pollutants, such as hydrocarbons, fuel, fuel additives, metal from corrosion of vehicles, lubricants, de-icer and gritting material, can accumulate on road surfaces. These can subsequently be washed off the road during rainfall events, polluting the receiving watercourses;
- ***Accidental Spillages***: on all roads there is a risk that accidents or vehicle fires may lead to an acute pollution incident. Where commercial vehicles are involved potential pollutants that may be spilled could range from hazardous chemicals to milk, alcoholic beverages, organic sludges and detergents;
- ***Watercourse Crossings and Diversions***: changes to watercourse dynamics through changes in channel gradient and profile can lead to changes to the sediment regime along the watercourse and reduce morphological diversity of the river channel, subsequently impacting on water quality.

5 Assessment Methods

5.1 The assessment of potential impacts has been undertaken following the guidance in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 10, HD 45/09 - Road Drainage and the Water Environment. It has been further informed by the guidance referred to in Section 3 above.

5.2 Consultations were held with NIEA, which included explanation of the assessment methods adopted.

5.3 The criteria used to assess the sensitivity or importance of water features (Very High, High, Medium or Low), the magnitude of the potential impacts (Major, Moderate, Minor or Negligible) and significance of potential effects (Very Large, Large, Moderate, Slight or Neutral) are summarised in Tables 16B.12/13/14/15 within Volume 3, Appendix 16B of the ES.

5.4 The impacts associated with construction, routine runoff, accidental spillage and watercourse crossings and diversions have been assessed separately using the methods described below.

Construction Impacts

5.5 A qualitative assessment of construction impacts was carried out, which involved a review of areas where construction is proposed in close proximity to watercourses and waterbodies and the proposed mitigation measures targeted at avoiding or minimising the risk of construction pollution.

Routine Runoff Impacts

5.6 HA 45/09 specifies mandatory procedures for the assessment of pollution impacts from routine runoff, known as Method A. This assessment comprises two separate elements:

- ***HAWRAT Assessment***: the Highways Agency Water Risk Assessment Tool (HAWRAT) is a Microsoft Excel application designed to assess the short-term risks related to the intermittent nature of road runoff. It assesses the acute and chronic pollution impacts on aquatic ecology associated with soluble and sediment bound pollutants respectively;

- ***EQS Assessment***: Environmental Quality Standards (EQS) are the maximum permissible annual average concentrations of potentially hazardous chemicals, as defined under the WFD. The long-term risks over the period of one year are assessed through comparison of the annual average concentration of pollutants discharged with the published EQS for those pollutants.

5.7 These assessments are carried out for each proposed road drainage outfall.

5.8 HAWRAT is a tiered consequential system which involves up to three assessment stages. Stage 1 determines pollutant concentrations in raw road runoff prior to any treatment or dilution in the receiving watercourse. Stage 2 assesses in-river pollutant concentrations after dilution and dispersion but without active mitigation. Stage 3 considers the in-river pollutant concentrations with active mitigation.

5.9 The underlying algorithms for assessing pollutants impacts are based on recent research undertaken by the Highways Agency (HA) and the Environment Agency of England and Wales (EA) on road runoff quality under a range of traffic and weather conditions. Recent ecological research has determined the toxicity thresholds for the typical pollutants in road runoff, and this is used in the tool to evaluate whether predicted concentrations are acceptable or not.

5.10 The tool also allows for the higher sensitivity of some receiving watercourses, such as protected conservation sites, by applying lower thresholds when assessing these outfalls.

5.11 The cumulative impact of multiple road drainage outfalls on a single reach of a river has also been assessed. River reaches can vary greatly in length. For the cumulative impact assessment of soluble pollutants only outfalls lying within 1km of each other are considered, as it is considered that pollutants from each outfall would be sufficiently diluted and dispersed over 1km as to have no additional cumulative impact. When assessing the cumulative impacts of sediment bound pollutants only outfalls lying within 100m of each other are assessed. Beyond 100m the routine runoff sediment, if it settles at all, is likely to be sufficiently diluted with natural sediment as to have no additional cumulative impact.

5.12 Detailed explanations of both the HAWRAT and EQS assessment methods are provided in Volume 3, Appendix 16B of the ES.

Accidental Spillage Impacts

5.13 The DMRB document HA 45/09 specifies mandatory procedures for the assessment of pollution impacts from accidental spillage, known as Method D. The assessment takes the form of a risk assessment, where the risk is expressed as the annual probability of a serious pollution incident occurring. This risk is the product of two probabilities:

- The probability that an accident will occur, resulting in a serious spillage of a polluting substance on the carriageway;
- The probability that, if such a spillage did occur, the polluting substance would reach the receiving watercourse and cause a serious pollution incident

5.14 The probability of a serious spillage occurring is dependent on a variety of factors: traffic volumes, percentage of heavy goods vehicles in the traffic volumes, whether the road is motorway, rural or urban trunk road, the road type categories within the road drainage catchment under assessment i.e. 'no junction', 'slip road', 'cross road' or 'roundabout', and the length of each road type within the catchment

5.15 The probability of a serious spillage causing a serious pollution incident is dependent on the receiving waterbody type, i.e. surface water or groundwater, and the response time of the emergency services, i.e. less than 20 minutes, less than one hour or greater than one hour.

5.16 Typically an annual probability of 1% (a 1 in 100 chance of a serious pollution incident occurring in any one year) is considered an acceptable risk. However where a road drainage outfall discharges within 1km of a sensitive receptor, such as a protected conservation site, a higher level of protection is required such that the risk has an annual probability of 0.5% (a 1 in 200 chance of occurring in any one year).

5.17 A detailed explanation of the accidental spillage assessment method is provided in Volume 3, Appendix 16B of the ES.

Watercourse Crossing & Diversion Impacts

5.18 The methodology adopted in this appraisal was developed using the guidelines from the DEFRA/EA R&D Technical Report FD1914 – Guidebook of Applied Fluvial Geomorphology.

5.19 A tiered approach was adopted for the qualitative geomorphology assessment. A preliminary desk study was carried out using high resolution aerial photography, mapping and site photographs collected earlier in the design process by the drainage design team. From this study it was determined that there would be no significant impact on the fluvial geomorphology at a large number of locations, which were subsequently ruled out of further investigations. These were generally small field drains with minimal flow and no evidence of historic instability.

5.20 A total of 46 sites were identified during the desk study as requiring field investigation. These were locations which displayed evidence of historic instability or where it was not possible from the desk study data to draw definite conclusions on the potential impact.

5.21 Of these sites 23 were considered to be less sensitive from a geomorphological perspective as they tended to be small watercourses and/or on low gradient ground where they would be less dynamic in nature. These sites were visited by an experienced site survey team, who had been briefed by an experienced geomorphologist. Extensive and detailed photographs of the site were taken, which were subsequently studied by the geomorphologist and an assessment of potential impact made. The desk study of the remaining 23 sites found evidence of planimetric instability or erosion and deposition. These were subsequently considered more geomorphologically sensitive and were therefore visited by an experienced geomorphologist. The field investigations took a river reconnaissance style approach or 'fluvial audit' of the relevant river reaches.

5.22 Following collection of baseline data on the fluvial geomorphology of the relevant watercourses the scheme proposals were reviewed for each location and a qualitative assessment of the potential impacts made.

5.23 Further details of the assessment are provided in Volume 1, Chapter 16, and Volume 3, Appendices 16B, 16C and 16D of the ES.

6 Mitigation

6.1 Mitigation is proposed to address potentially significant adverse impacts where practicable, including all impacts assessed as being of greater than 'slight' significance.

6.2 Mitigation measures include those to avoid impacts during the construction phase, those to convey road runoff to receiving watercourses without detrimental effect on surface water quality and associated ecosystems, and those to reduce impact on geomorphological features through required culverting and watercourse diversions.

6.3 Mitigation measures for all watercourses aim to preserve the current water quality and ecological status of any watercourse and aid in achieving 'good' ecological status, as defined under the WFD, in the future.

6.4 Mitigation measures typically comprise solutions aimed at the source of the impact. The risk of causing deterioration in status of each watercourse can be reduced by 'designing out' risk. This has been taken into consideration during the selection and design of the Preferred Route i.e. to avoid sensitive water features where possible. However this has to be balanced with other engineering constraints and environmental impacts.

6.5 Where potential adverse impacts cannot be prevented mitigation measures have been proposed. Major design components such as road drainage, bridges, culverts and watercourse diversions have been developed through an iterative process involving specialists from the relevant engineering and environmental disciplines.

Construction

6.6 Construction mitigation measures have been discussed and agreed with the construction contractors prior to their inclusion in the Environmental Statement, and would be incorporated into the Construction Environmental Management Plan (CEMP).

6.7 On site working practices would adhere to the principles detailed in the CEMP and Construction Method Statements (CMS), drafts of which are provided in Volume 3, Appendix 6G of the ES. These documents would ensure that the construction activities are planned and managed in accordance with the environmental requirements identified within the ES.

6.8 Construction Method Statements would be developed by the construction contractors for activities that could potentially cause significant environmental impacts. This would include CMSs for site clearance, soil strip, earthworks, drainage, construction of bridges, culverts, watercourse diversions and outfalls. All CMSs would be informed by the relevant Pollution Prevention Guidelines (PPGs) as published by NIEA. Measures which the contractors would be required to incorporate into the method statements would include:

- Storage of fuels and potentially hazardous construction materials in bunded storage areas with external cut off drainage; fuel would be stored in double skinned tanks with 110% capacity.

- Fuelling and lubrication of construction vehicles and plant would be on hardstandings or on haul roads located away from watercourses, where reasonably practicable.

- Regular inspection of construction plant to check for oil or fuel leaks and specific checks prior to commencement and throughout extended periods of activity near to watercourses.

- Washdown water from aggregate storage areas, delivery wagons and concrete lorries would be collected and treated appropriately before discharge, or disposed of off-site

- All sewage and effluent from site welfare facilities would be treated and disposed of appropriately. Depending on the site specific conditions this could be through discharge to foul sewer, discharge to a watercourse via septic tank or small treatment plant, or disposal off-site.

- Intercept drains would be used immediately uphill of the works area and areas of exposed soil. Bunds made from non-erodible material such as straw bales or geotextiles, would be placed around excavations and stockpiles to prevent clean water entering and dirty water from leaving the area.

- Vegetation clearance would be restricted to the immediate area of the works. In the vicinity of watercourses clearance would be undertaken immediately prior to commencement of the works, to reduce the risk of bank erosion and sediment pollution. Vegetation would be re-established as soon as practicable.

- Contaminated water would be treated appropriately before discharge. This may be through the use of silt fences, silt traps, filter bunds (possibly straw bales or gravel bunds), settlement ponds and/or proprietary silt treatment units such as a 'siltbuster'.

- Wherever possible culverts and diversions would be constructed offline with the original channel diverted once the construction is completed.

- Where engineering works are to be carried out in, or on the banks of, rivers and streams the work area would be isolated and dewatered to create dry working conditions and reduce the risk of sediment pollution. The method of isolation used would be dependent on the scale and timing of the works and the size and sensitivity of the watercourse. In each case the design of the isolation method would take into account potential increases in flood risk, changes to flow patterns, velocities and water levels, the potential for bed and bank scour and the need for fish passage, if appropriate. In-stream works would be programmed to reduce the disruption to fish and aquatic mammal passage and the duration of the works would be kept as short as possible.

- As part of the in-stream works the bed and banks of the watercourse would be reinstated to as close to the pre-works condition as is practicable.

- A water quality monitoring programme would be agreed with NIEA and implemented throughout the construction phase.

Drainage Design

6.9 The A5 WTC road drainage system has been designed to reduce potentially significant impacts on surface water quality.

6.10 The proposed A5 WTC road drainage has been derived through an iterative design and assessment process undertaken by the Drainage Design and Water Environment disciplines. This process has enabled appropriate design and mitigation measures to be incorporated within the proposed scheme.

Discharge Mitigation

6.11 All outfalls have been designed to discharge to surface waters, as desk studies and preliminary ground investigations have shown that hydrogeological conditions throughout the A5 WTC corridor are unsuitable for groundwater discharges.

6.12 Where the road drainage outfalls discharge to larger rivers with sufficient flow to dilute the road runoff active mitigation is not necessary. However where the outfalls are located on smaller watercourses, with less flow, active mitigation is required.

6.13 The water quality mitigation put in place at each outfall has been dependent on the type and level of treatment required, either for soluble and/or sediment bound pollutants, as indicated at Stage 2 of the HAWRAT assessment.

6.14 For each outfall a sustainable urban drainage system (SUDS) 'treatment train' is proposed which comprises a series of mitigation measures such as manhole silt traps, oil bypass separators, attenuation ponds and surface flow wetlands.

6.15 As standard, every road drainage outfall would have a manhole silt trap and oil bypass separator installed. These would provide treatment for hydrocarbons and some treatment of sediment bound pollutants through settlement of the sediments.

6.16 Attenuation ponds are principally used to control the rate of discharge from the road drainage system, by accepting large inflows but discharging slowly. However they also provide some treatment of sediment bound pollutants through settlement of the sediments and minor treatment of soluble pollutants through adsorption, plant uptake and pollutants binding to soil particles. The treatment potential of attenuation ponds is limited due to the relatively short time that runoff is detained within the pond.

6.17 A wetland is essentially a shallow basin which is kept permanently wet and is planted with common reed swamp vegetation. The vegetation within the wetland provides significant treatment of both soluble and sediment bound pollutants through filtration, adsorption and plant uptake.

6.18 The above mentioned treatment measures would also provide protection against pollution as a result of accidental spillage, as they provide containment and storage of the polluted runoff before it can reach the receiving watercourse.

Outfall Structures

6.19 To reduce the risk of sediment accumulation, fish entrapment and erosion of the watercourse bed and banks in the vicinity of the outfall, the following design features would be incorporated into the outfall structure:

- The outfall structure would be a bankside outfall with mitred headwall for ease of maintenance.
- The outfall would be located on a straight section of the watercourse, where active erosion and deposition are less likely
- The outfall would discharge in the direction of flow, ideally angled at 45° to the direction of flow, to reduce the risk of turbulence and resultant erosion.
- No part of the outfall structure would protrude beyond the line of the watercourse bank; this would include headwalls, wingwalls and protection aprons, where used.
- The height of the outfall pipe would be optimised. It should be low enough to minimise the height between the outfall pipe and watercourse bed, thus minimising scour, but high enough to ensure that the pipe remains clear of any sediment build-up and that high water levels within the watercourse do not back up into the road drainage system.
- Appropriate erosion protection would be used where high velocity discharges may result in scour. This may take the form of a stilling basin, erosion protection apron, stone rip-rap or geotextiles. Erosion protection on the opposite bank may also be used if deemed appropriate.
- Where there is a risk of backflow up the outfall pipe during high river flows a flap valve may be fitted. This would be selected and fitted for ease of maintenance and to reduce any risk of blockages or entrapment of otters and fish.

6.20 Regular monitoring and maintenance of all elements of the drainage system would be undertaken, including the surface flow wetlands and attenuation ponds to ensure efficient operation.

Bridge Crossings

6.21 Bridges are proposed at the following locations: the Burn Dennet, Glenmornan, Mourne, Derg, Coolaghy Burn, Fairy Water, Drumragh, Routing Burn and Ballygawley rivers. Bridging these higher sensitivity rivers, most of which are designated salmonid watercourses, would reduce adverse impacts to water quality, hydrological regime, geomorphological, and reduce construction phase risks.

6.22 The bridges have been designed such that no piers would be located in the normal flow channel, which would avoid the need for in-channel works at any of these crossing points. During construction this significantly reduces the potential for accidental spillage and sediment release within the water channel, while during the operational phase the impact on the geomorphology of the river would be reduced.

6.23 Bridge abutments would be set back from the river channel and bank to allow the continuation of the riparian corridor beneath the bridge. The bridges should be sufficiently high to allow enough natural light through to maintain the riparian vegetation. This would reduce the risk of erosion and subsequent impacts on water quality.

Culvert Crossings

6.24 Mitigation in relation to the culverts would comprise the following measures:

- The invert of each culvert would be buried below natural bed level and backfilled with appropriate bed material wherever possible to allow the natural bed level to be maintained. A minimum depth of 150mm bed material would be maintained within the culverts to ensure the material is retained during high flows. The culverts have been oversized to ensure the hydraulic capacity is maintained with this bed material in-situ;

- Wherever possible the culvert gradient has been designed to reflect the existing watercourse gradient to avoid excessive erosion or siltation. Where a marked change in gradient cannot be avoided the structure would be carefully designed to avoid excessive erosion;

- When sizing the culverts the natural channel width has been retained wherever possible. This reduces the risk of erosion and helps to maintain the existing water depths, particularly at low flows;

- Each culvert would be assessed for the need for scour protection around the culvert and appropriate erosion protection incorporated into the design as required. The erosion protection would be carefully chosen so as not to impact on fish passage. For instance the use of gabion baskets at the culvert outfall may be inappropriate, as under low flow conditions the water may flow through the gabions rather than over them, effectively preventing fish migration.

Watercourse Diversions

6.25 Watercourse diversions have been avoided on the higher sensitivity watercourses and are generally confined to field drains and small previously modified streams. Diversions are proposed to reduce the number of culverts where the watercourse weaves across the road alignment repeatedly within a short distance, where the road alignment lies over the top of the watercourse channel, and to reduce culvert lengths by realigning the watercourse to cross underneath the A5 WTC at 90 degrees.

6.26 Where possible the diversions would be designed to reflect the original alignment in terms of gradient, cross-section and plan-form, using the following broad principles:

- Diversions would be designed to ensure that the realigned channel lengths are similar to the original channel length as far as possible in order to maintain the original gradient.

- Sharp bends would be avoided in the channel plan-form, as these may be prone to bank erosion. Where this is unavoidable appropriate erosion protection, such as lining the channel with geotextile or similar, would be incorporated into the design.

- The channel cross-section shape would be designed to ensure that the bed and banks are stable, and where possible would resemble the existing characteristics.

- Bankside and channel vegetation would be replaced like-for-like to maintain the original habitats and protect against bank erosion.

7 Predicted Impacts

7.1 In this section of my evidence I outline the potentially significant impacts and how the design and mitigation measures I have previously described address these.

Construction

River Foyle & Tributaries SAC

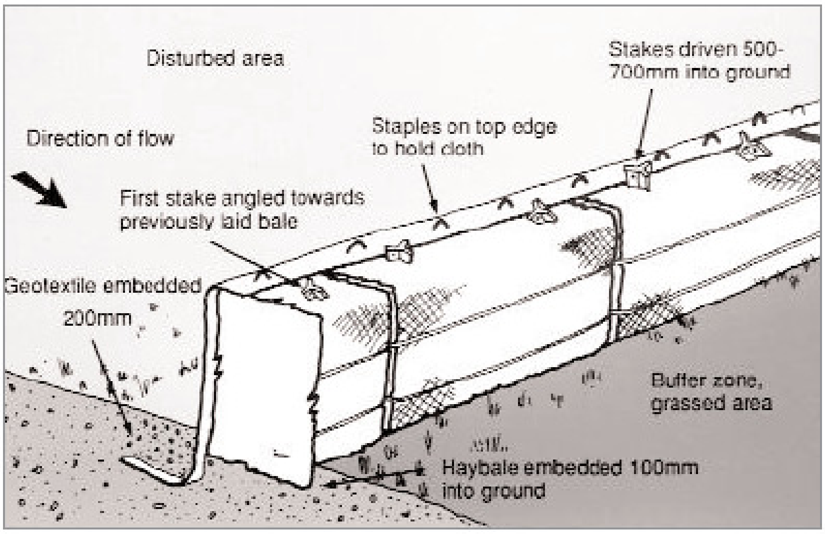
7.2 The River Foyle and the River Finn are both part of the River Foyle and Tributaries SAC, and as such have been classified as attributes of Very High importance.

7.3 There are two locations, between Chainage 500 – 1000 and Chainage 18750 – 19250 where the route would pass within 20m of the River Foyle and 10m of the River Finn respectively. During construction there is a potential risk of pollution to these rivers from sediment or accidental spillage of construction related chemicals e.g. fuel or concrete.

7.4 In addition to the construction mitigation outlined earlier in this evidence, further measures would be implemented in these locations. A temporary lined barrier would be installed between the rivers and the construction site along the relevant lengths of the corridor. The lined barrier may consist of straw bales and geotextile filter fabric (silt fence) used together, as shown in Figure 7.1, or a similar arrangement. The barrier would be inspected daily to ensure effectiveness and earthworks would cease in these areas during heavy rainfall. There would be no direct discharge of site runoff to the Foyle or the Finn. All site runoff would be treated appropriately for sediment and hydrocarbons before release.

7.5 With these measures in place I am confident the impact on the water quality of the River Foyle and River Finn would be of Neutral significance.

Figure 7.1 Straw bale and silt fence arrangement to control silty runoff (taken from CIRIA Report C648)



7.6 The scheme proposals also include the construction of three outfall structures within the tidal reach of the River Foyle and a further four within the tidal reach of the River Finn, all within the SAC boundary. The outfalls would discharge at the low water mark and would therefore require construction within the intertidal zone.

7.7 The outfall structures would be constructed within a dewatered cofferdam, which would provide dry conditions for construction activities and isolate the construction site from the tidal influence, thereby reducing the mobilisation of sediment. Given the scale of the rivers and the natural sediment mobilisation under tidal influences I am confident the impact of this localised construction work would be of Neutral significance.

7.8 A bridge is proposed on the River Mourne which, as part of the River Foyle SAC, is considered an attribute of Very High importance. Whilst this structure has been designed with a clear span to avoid construction within the channel, there is a need for bank protection works to address potential erosion in the vicinity of structure. These works would require the use of a cofferdam along the margins of the watercourse to isolate the construction site from the river flow and prevent ingress of sediment to the watercourse.

7.9 The general construction mitigation in conjunction with the use of a cofferdam would provide sufficient protection against pollution, such that I am confident that the residual significance of the potential impact is Neutral.

7.10 The River Derg is also part of the Rover Foyle and Tributaries SAC and is considered an attribute of Very High importance.

7.11 A bridge crossing and two separate road drainage outfalls are proposed on this river. The bridge would be a clear span structure, thereby avoiding construction within the channel, however some bank protection works would be required to reduce erosion potential around the structure. The outfall structures would be constructed flush to the river bank. These works would require temporary cofferdams to isolate the construction sites from the river flow, provide dry working conditions and prevent ingress of sediment to the watercourse.

7.12 The general construction mitigation in conjunction with the use of a cofferdam would provide sufficient protection against pollution, such that I am confident the residual significance of the potential impact is Neutral.

Other Large Rivers

7.13 The Burn Dennet, Glenmornan, Coolaghy Burn, Fairy Water, Drumragh, Routing Burn and Ballygawley rivers have been assessed as attributes of High or Moderate importance.

7.14 Clear span bridge crossings are proposed for each of these rivers, with one or two road drainage outfalls discharging to each (three in the case of the Burn Dennet River).

7.15 As before, erosion protection works and construction of the outfalls would require bankside works activities, which would be isolated from the river flow using cofferdams. These measures, in addition to the general construction mitigation which would be applied throughout the A5WTC corridor, would provide protection against accidental spillage and sediment release such I am confident that the potential impact significance would be Neutral.

Streams & Field Drains

7.16 The remaining culverts, diversions and road drainage outfalls would be constructed on small streams and field drains of Low or Moderate attribute importance.

7.17 Construction of these scheme elements would be under dry working conditions, with a variety of isolation methods used to achieve this. In many cases the culverts would be constructed offline, with the watercourse realigned through the culvert upon completion. Where online construction is necessary the method of isolation would be tailored to the particular requirements of the site.

7.18 With these measures in place I am confident that the potential impacts on water quality would be short term and of Neutral/Slight significance.

Routine Runoff

7.19 The results of the HAWRAT and EQS assessment (as described in Chapter 6 of this evidence) for each road drainage outfall are presented in Appendices 16D and 16E of the A5 WTC ES.

7.20 The assessments have demonstrated that with the proposed SUDs mitigation all but three outfalls pass all aspects of both assessments.

7.21 Outfalls S1-OF-31, S1-OF-35 and S3-OF-12 fail elements of the HAWRAT assessment, however they do pass the EQS assessment.

Outfall S1-OF-31

7.22 S1-OF-31, located close to the north western extent of Strabane at approximately Ch. 15750, discharges into a small unnamed field drain, which flows into the larger Backfence Drain approximately 130m downstream of the discharge location. Both watercourses have been assessed as being of Low attribute importance.

7.23 The drainage proposals for this outfall include a silt trap manhole, oil bypass separator and attenuation pond. With this treatment in place the outfall fails the assessment for soluble pollutants, but passes for sediment bound pollutants. This failure arises due to the low volumes of natural diluting flow in the field drain. Once the field drain joins the larger Backfence Drain the road runoff is sufficiently diluted that it would pass all elements of the HAWRAT assessment, if it was assessed at confluence.

7.24 With the proposed mitigation in place the residual impact on the field drain is of minor adverse magnitude, resulting in a potential effect of Neutral significance. The impact on the Backfence Drain is of negligible magnitude, and Neutral significance.

Outfall S1-OF-35

7.25 S1-OF-35, located immediately south of the River Mourne at Strabane (approx. Ch. 18000), discharges into a small unnamed field drain, which flows into the River Mourne approximately 155m downstream of the discharge location. The field drain begins approximately 240m upstream of the discharge location and is believed to receive surface runoff from the adjacent housing estate. It is proposed that the field drain would be culverted and diverted to pass under the A5 WTC at 90 degrees. The outfall would discharge into the diversion immediately downstream of the culvert. The diverted watercourse would lie within the permanent fenceline line of the scheme, up to the bank of the River Mourne.

7.26 The field drain has been assessed as having a Low attribute importance. The River Mourne, as part of the River Foyle and Tributaries SAC, is an attribute of Very High importance.

7.27 The drainage proposals for this outfall include a silt trap manhole and oil bypass separator. With this treatment in place the outfall fails both the soluble and sediment bound pollutant elements of the HAWRAT assessment. This failure arises due to the low volumes of natural diluting flow in the field drain and the shallow gradient of the watercourse channel. Once the field drain joins the River Mourne the runoff is sufficiently diluted that it would pass all elements of the HAWRAT assessment, if it was assessed at the confluence.

7.28 With the proposed mitigation in place the residual impact on the field drain is of moderate adverse magnitude, resulting in a potential effect of Slight significance.

The impact on the River Mourne is of negligible magnitude, and Neutral significance.

Outfall S3-OF-12

7.29 S3-OF-12, located south west of Ballynasaggart at approximately Ch. 81000, discharges into a small unnamed field drain, which flows into the Roughan River approximately 140m downstream of the discharge location.

7.30 The field drain has been assessed as having a Low attribute importance. The Roughan River is an attribute of Medium importance.

7.31 The drainage proposals for this outfall include a silt trap manhole, oil bypass separator, surface flow wetland and hybrid wetland/attenuation pond in series. With this treatment in place the outfall fails both the soluble and sediment bound pollutant elements of the HAWRAT assessment. This failure arises due to the low volumes of natural diluting flow in the field drain and the shallow gradient of the watercourse channel. Once the field drain joins the Roughan River the runoff is sufficiently diluted that it would pass all elements of the HAWRAT assessment, if it was assessed at the confluence.

7.32 With the proposed mitigation in place the residual impact on the field drain is of moderate adverse magnitude, resulting in a potential effect of Slight significance. The impact on the Roughan River is of negligible magnitude, and Neutral significance.

Outfalls S1-OF-23.1 and S1-OF-38

7.33 Cumulative assessments were required for 17 groups of outfalls, where the outfalls in each group were located on the same reach of watercourse. All but one of these groups passed all aspects of the HAWRAT and EQS assessments. The exception occurs where S1-OF-23.1 and S1-OF-38 discharge into the Flushtown Burn within 95m of each other.

7.34 The Flushtown Burn, located in the Knockroe area on the southern outskirts of Strabane, is a small, heavily modified stream which has been assessed as having a Low attribute importance.

7.35 The drainage proposals for these outfalls include silt trap manholes, bypass separators and attenuation ponds at both, and a surface flow wetland at S1-OF-23.1.

7.36 These outfalls passed all elements of the water quality assessment individually. They also passed the cumulative EQS assessment and the cumulative soluble pollutant element of the HAWRAT assessment, however they failed the cumulative HAWRAT assessment for sediment bound pollutants.

7.37 The assessment of sediment bound pollutants found that overall sediment settlement of 75% was required for the outfalls to pass the cumulative assessment, however the proposed treatment would deliver only 69% settlement overall.

7.38 This would result in an impact of minor magnitude on the Flushtown Burn, with an effect of Neutral significance.

7.39 Although these outfalls have failed the sediment element of the HAWRAT assessment it should be noted that the separation between the discharge points is close to the limit for cumulative sediment impacts. This, in conjunction with the proposed treatment which would substantially reduce the sediment released and the precautionary approach used throughout the assessment, is likely to result in a cumulative impact that is barely detectable.

Summary

7.40 My evidence above demonstrates that there are four watercourses throughout the scheme where a discernable residual impact on water quality may be possible. However given the nature of these watercourses, I am of the view that the residual impacts are not significant.

7.41 Putting this into the context of the WFD, I am confident that there would be no detrimental impact on the overall status of the designated waterbodies that these watercourses are constituents of.

Accidental Spillage

7.42 The results of the Accidental Spillage assessment (as described in Chapter 6 of this evidence) for each road drainage outfall are presented in Volume 3, Appendix 16D of the ES.

7.43 The assessments have demonstrated that, for an individual outfall, the worst annual probability of a serious pollution incident as a result of accidental spillage, after mitigation, would be 0.18% (i.e. a 1 in 563 chance of occurring in any one year). This is considerably better than the target of 1% or 1 in 100 chance (0.5% or 1 in 200 chance for sensitive watercourses) recommended in the DMRB guidance.

7.44 The cumulative assessments carried out for outfalls in close proximity found that the worst annual probability would be 0.09% (i.e. a 1 in 1121 chance of occurring in any one year).

Surface Water Abstractions

7.45 As part of the environmental assessment process a survey of all surface water and groundwater abstractions has been undertaken. This survey was initiated in April 2010 with a letter questionnaire sent to all landowners affected by the A5WTC proposals. The response rate to the questionnaire is currently approximately 50% and the geographical distribution of the responses is quite patchy. The questionnaires are being supplemented with data collected during the landowner consultation meetings, which is an ongoing process.

7.46 Details on the groundwater abstractions identified and related mitigation are dealt with in the evidence of Paul Reid.

7.47 Of the surface water abstractions identified to date the majority are livestock watering points on small streams and field drains. Two industrial abstractions have been identified. A significant number of these abstractions would be unaffected by the A5 WTC proposals due to their location upstream of the proposed works.

7.48 The remaining abstractions are either located within the working area of the proposed scheme or in close proximity downstream and may be affected by the construction, and in a small number of cases the operation, of the A5 WTC.

7.49 It is expected that further abstractions would be identified as the scheme is progressed, particularly livestock watering points which are likely to be widespread.

7.50 To mitigate any potentially significant impacts one of a number of options would be adopted as follows:

- Provide a temporary replacement during the construction phase.

- Provide a permanent replacement at a mutually agreeable location within the landholding.

- Provide an alternative mains water connection.

7.51 The most appropriate solution would depend on the local site conditions, abstraction usage and the potential impact. The solution would be agreed with the owner following the inquiry and installed before construction starts.

8 Conclusions

8.1 I would conclude as follows:

- In relation to construction, with the design and mitigation measures proposed I am satisfied that there would be no significant impacts on surface water quality or fluvial geomorphology in the vicinity of the Proposed Scheme;
- In relation to the River Foyle and Tributaries SAC I am satisfied that with the proposed design and mitigation measures in place there would be no significant impacts on the water quality of the SAC;
- In relation to routine runoff I am satisfied that with the proposed design and mitigation measures in place there will be no significant water quality impacts;
- In relation to accidental spillages I am satisfied that with the proposed design and mitigation measures in place there will be no significant water quality impacts.

8.2 Overall I am satisfied that the mitigation measures I have discussed, together with those reported in the A5 WTC ES, are comprehensive and appropriate to mitigate the impacts I have described. I am of the view that the residual impacts on surface water quality are not significant.

9 References

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